ECOPROPHET

Improved **ECO**system **PRO**ductivity Modeling by Innovative Algorithms and Remotely Sensed **PHE**nology Indicators

Promotors: Prof. Ivan Janssens & Manuela Balzarolo

12 - 13 SEPTEMBER 2019,BRUSSELS (BELGIUM)

ECOPROPHET *"Improved Ecosystem Productivity Modeling by Innovative Algorithms and Remotely Sensed Phenology Indicators"* is a project funded by BELSPO (Belgian Science Policy Office) in the frame of the STEREO III programme (Contract number: SR/00/334)

Project team

Coordinator
University of Antwerp
UA

- Ivan JANSSENS (PI) & Manuela BALZAROLO (PI)
- Maral MALEKI - PhD Student*
- Sebastian WIENEKE (Marie Curie fellow from July 2018)
- Matteo CAMPIOLI
- Sara VICCA
- Qiang LIU (PhD, starting in Oct/Nov 2019)

Belgian partner 1
Royal Meteorological Institute
P1, RMI

- Françoise MEULENBERGHS
- Rafiq HAMDI
- Miguel BARRIOS*
- Alirio ARBOLEDA
- Nicolas GHILAIN (till April 2019)
- Jan DE PUE* (from August 2019)

International partner 1
Peking University
IP1, PKU

- Shilong PIAO
- Sushi PENG
- Zaichun ZHU
- Qiang LIU
- Post-doc researcher*

International partner 2
Laboratoire des Sciences du Climat et de l'Environnement
IP2, LSCE

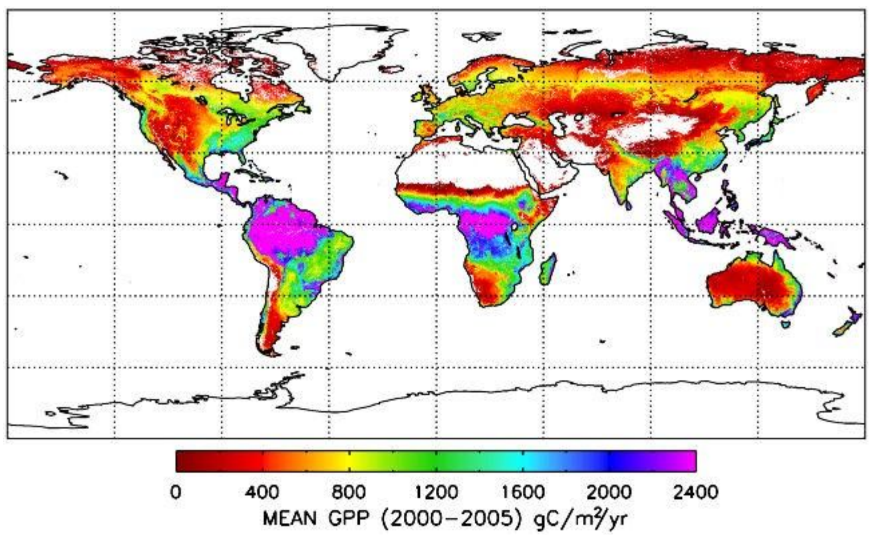
- Philippe CIAIS
- Ana BASTOS (left for Munich in March 2018)
- Fabienne MAIGNAN
- Xiuzhi CHEN* (back in China in May 2019)
- Liyang LIU (PhD, arriving in Oct/Nov 2019)

Motivation

Terrestrial ecosystems provide food, feed, fibre, …

 Important to monitor global ecosystem productivity and build better models

 R:S-based models & Land surface models



MOD17

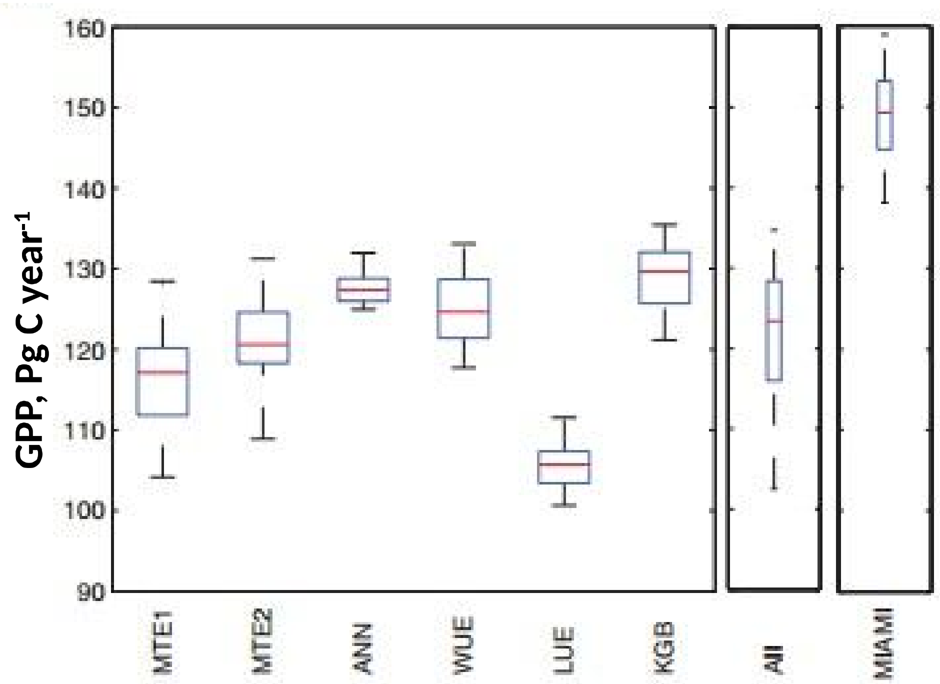
Motivation

Terrestrial ecosystems provide food, feed, fibre, …

 Huge uncertainty in global GPP & NPP estimates

GPP:

Beer et al. Science 2010



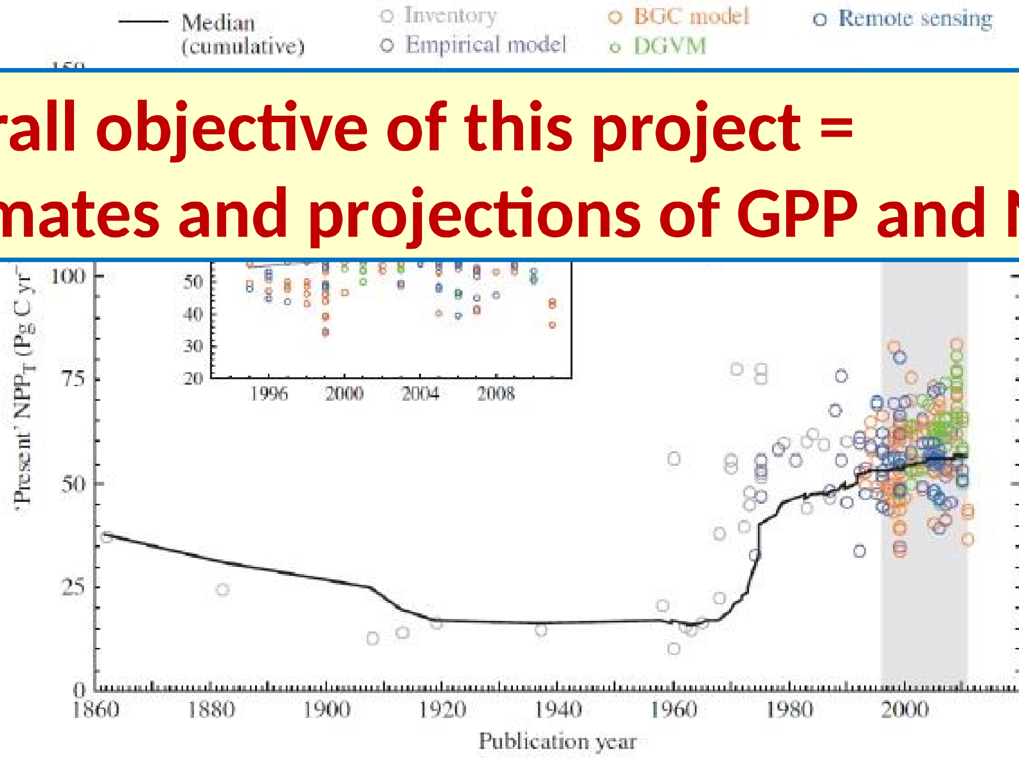
Motivation

Terrestrial ecosystems provide food, feed, fibre, …

 Huge uncertainty in global GPP & NPP estimates

Overall objective of this project =
improve estimates and projections of GPP and NPP

NPP:
Ito, GCB 2011

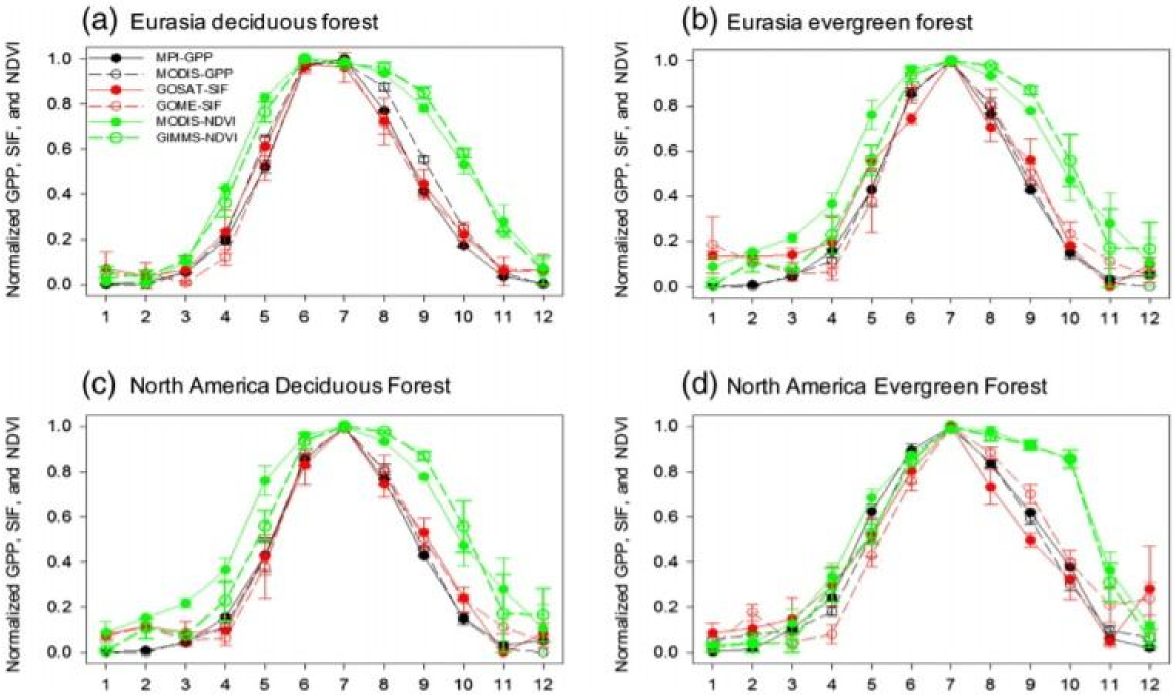


Greening of the Earth

Both R:S-based and Land surface models depend on observations of surface greenness (**NDVI**, **fAPAR**)

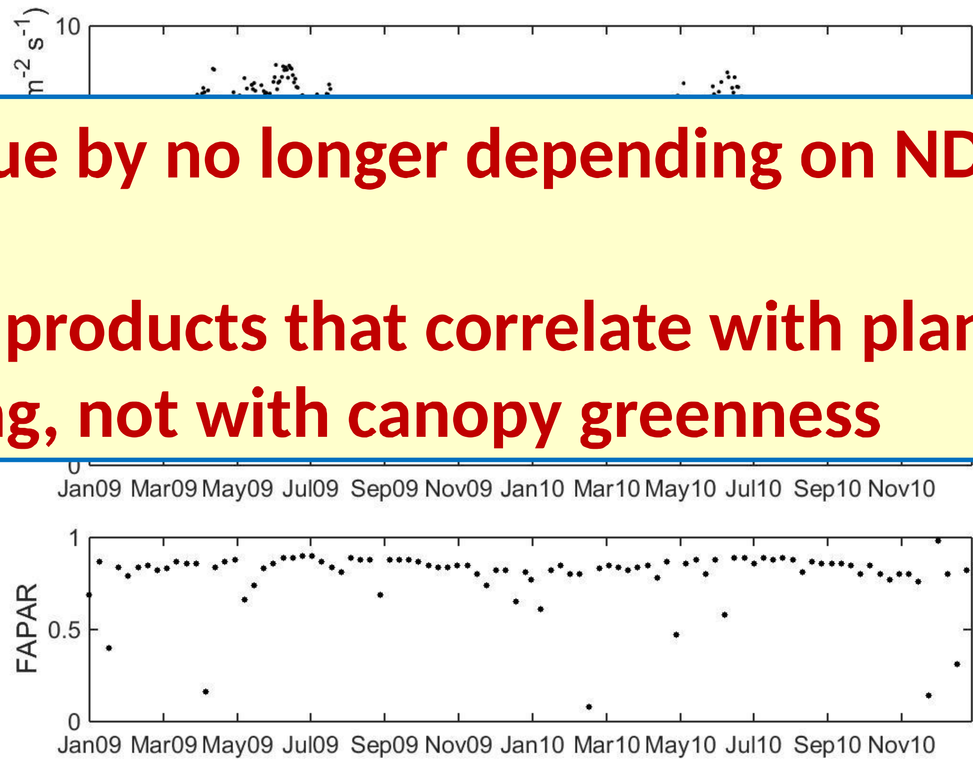
NDVI ≠ GPP

Jeong, RSE 2017



Greening of the Earth

e.g. Mediterranean oak forest



Resolve this issue by no longer depending on NDVI

** Use new RS products that correlate with plant functioning, not with canopy greenness**

Reports 2016

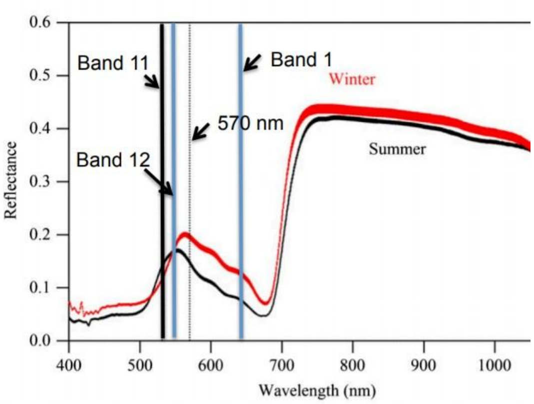
“Invisible” evergreen phenology

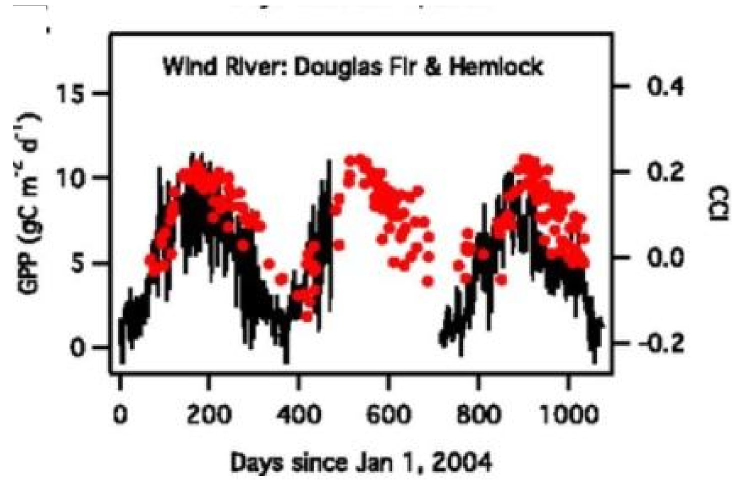
CCI

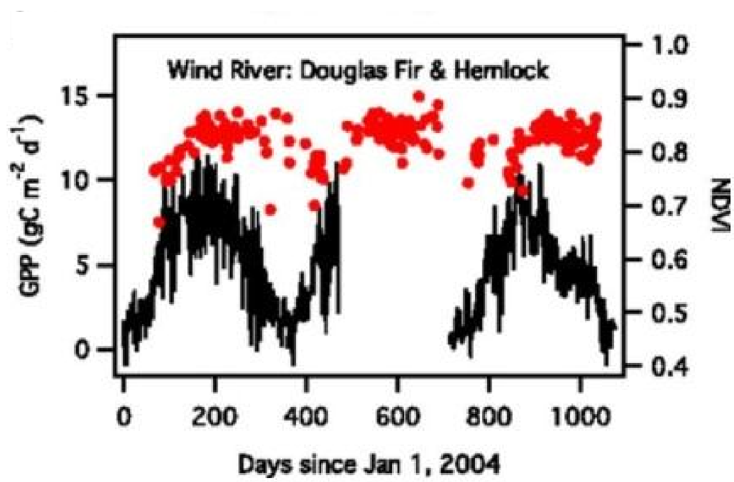
Gamon et al.,
PNAS 2016

Chlorophyll:Carotenoid Index:

$$CCI = \frac{(Band\ 11 - Band\ 1)}{(Band\ 11 + Band\ 1)}$$



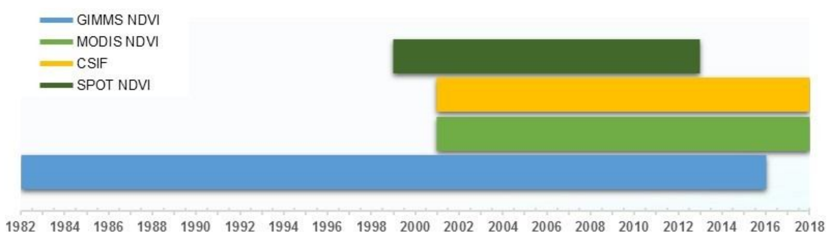




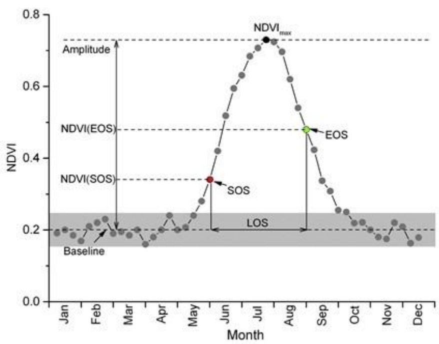
SOS & EOS uncertainty

Extracting the Start/End of Growing Season across the Northern Hemisphere

1 Satellite observation



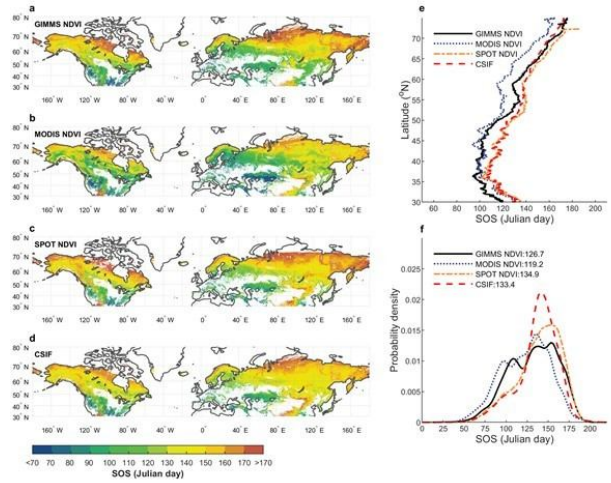
2 Four phenological extraction methods



<u>Step1: data smoothing using filter function</u> (eliminate noise existed in NDVI seasonal curve, convert NDVI data to a daily basis)

<u>Step2: determine the date of Start of growing season (SOS)</u> (using predefined thresholds or changing characteristics of NDVI curve)

3 Intercomparison of satellite-derived SOS



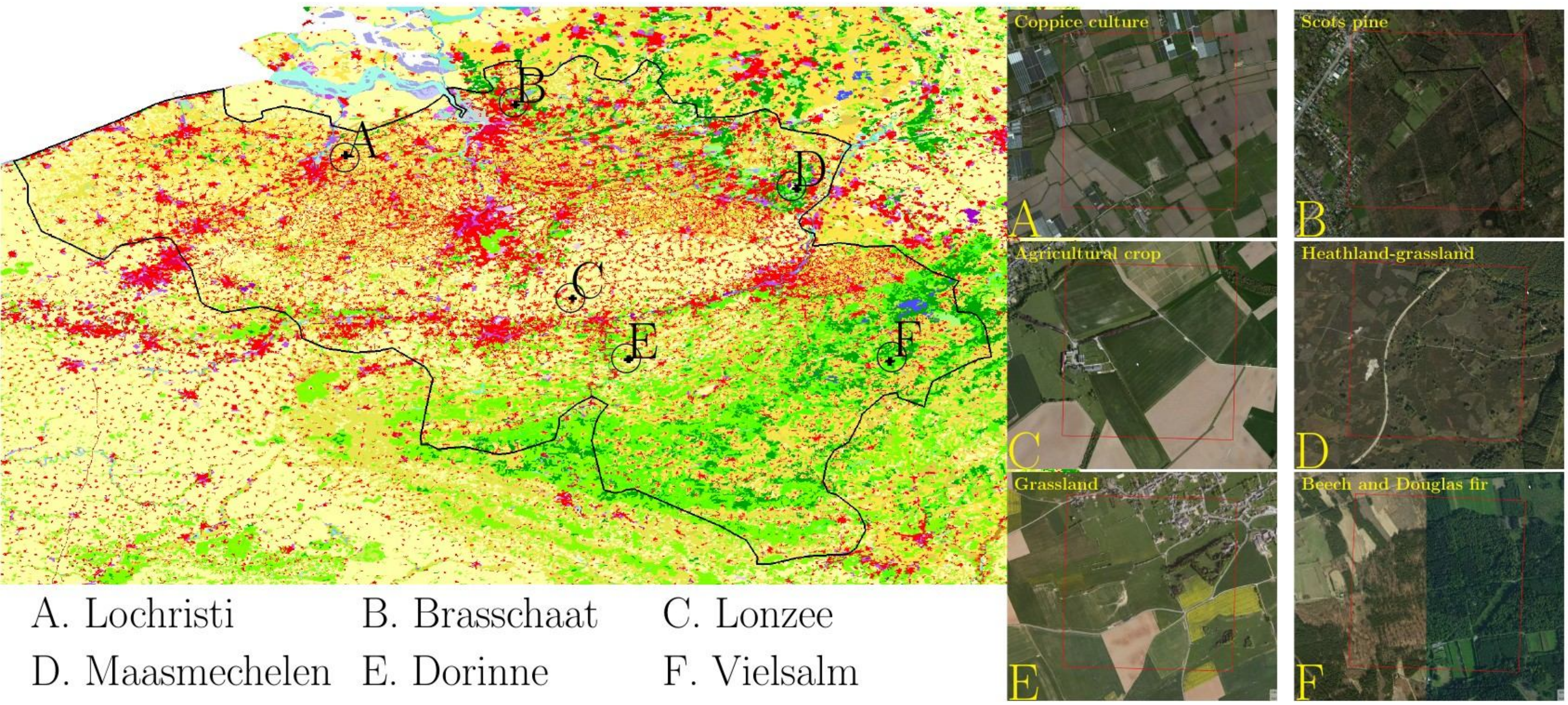
PEKING UNIVERSITY

Prof. Shilong Piao's research group

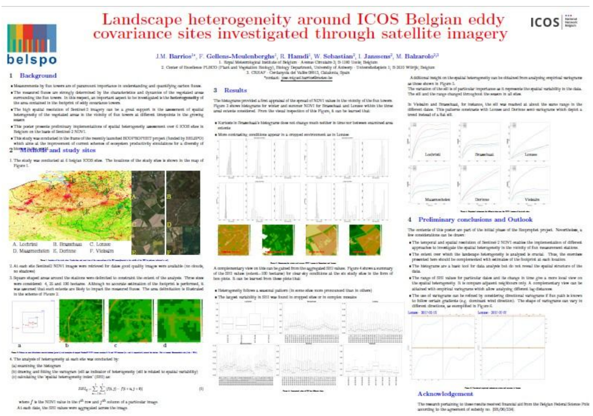
Alternative RS indicator

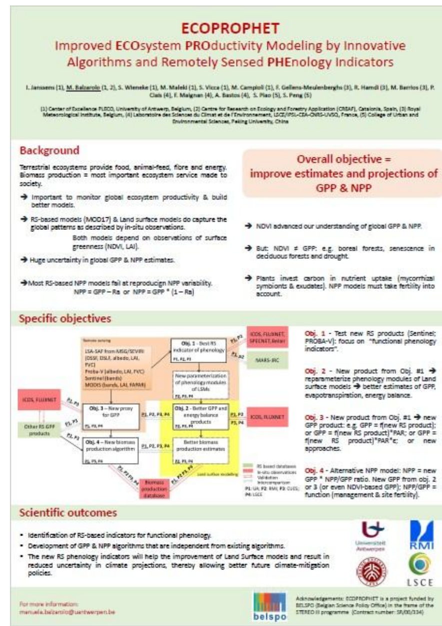
Sentinel-2: MTCI, ChlRedEdge, NDVIg, MCARI, PSSR

Belgium (Ongoing), Tropics (Start soon), Europe (Planned)



http://ecoprophet.meteo.be





ECOPROPHET

Improved **ECO**system **PRO**ductivity Modeling by Innovative Algorithms and Remotely Sensed **PHE**nology Indicators

Promotors: Prof. Ivan Janssens & Manuela Balzarolo

12 - 13 SEPTEMBER 2019,BRUSSELS (BELGIUM)

ECOPROPHET *"Improved Ecosystem Productivity Modeling by Innovative Algorithms and Remotely Sensed Phenology Indicators"* is a project funded by BELSPO (Belgian Science Policy Office) in the frame of the STEREO III programme (Contract number: SR/00/334)